AMENDMENTS TO THE CLAIMS

1. (Currently amended) A method of testing the effect of a candidate compound on the transmembrane potential of one or more biological cells comprising:

exposing one or more cells comprising at least one voltage regulated ion channel to said compound;

repetitively exposing said one or more cells to a series of two or more electric fields so as to effect a change in transmembrane potential of said one or more cells without using a patch clamp, wherein said transmembrane potential changes predominantly in a single direction away from a starting transmembrane potential over the course of said series of electric fields due to a continuing and additive accumulation of charge in said cells over the course of said series of electric fields; and

monitoring, without using a patch clamp, changes in the transmembrane potential of said one or more cells to test the effect of said compound on said one or more biological cells.

2. (Original) The method of Claim 1, wherein said monitoring comprises detecting fluorescence emission from an area of observation containing said one or more cells.

3. (Original) The method of Claim 1, wherein said electric fields are biphasic.

4. (Original) The method of Claim 3, additionally comprising limiting spatial variation in electric field intensity so as to minimize irreversible cell electroporation.

5. (Original) The method of Claim 1, wherein one or more electrical fields cause an ion channel of interest to cycle between different voltage dependent states.

6. (Original) The method of Claim 5, wherein said one or more electrical fields cause an ion channel of interest to open.

7. (Original) The method of Claim 5, wherein said one or more electrical fields cause an ion channel of interest to be released from inactivation.

8. (Original) The method of Claim 1, wherein said one or more cells comprise a voltage sensor selected from the group consisting of a FRET based voltage sensor, an electrochromic transmembrane potential dye, a transmembrane potential redistribution dye, an ion sensitive fluorescent or luminescent molecule and a radioactive ion.

9. (Canceled)

10. (Original) The method of Claim 9, wherein said voltage regulated ion channel is selected from the group consisting of a potassium channel, a calcium channel, a chloride channel and a sodium channel.

11. (Previously presented) The method of Claim 1, wherein said electric fields exhibits limited spatial variation in intensity in the area of observation of less than about 25% from a mean intensity in that area.

12. (Previously presented) The method of Claim 11, wherein said two or more electrical fields varies over an area of observation by no more than about 15 % from the mean electrical field at any one time.

13. (Previously presented) The method of Claim 12, wherein said two or more electrical fields varies over an area of observation by no more than about 5 % from the mean electrical field at any one time.

14. (Previously presented) The method of Claim 1, wherein said two or more electrical fields comprises stimulation with either a square wave-form, a sinusoidal wave-form or a saw tooth wave-form.

15. (Previously presented) The method of Claim 1, wherein said two or more electrical fields have an amplitude within the range of about 10 V/cm to about 100 V/cm.

16. (Previously presented) The method of Claim 15, wherein said two or more electrical fields have an amplitude within the range of about 20 V/cm to about 80 V/cm.

17. (Previously presented) The method of Claim 1, wherein said two or more electrical fields are repeated at a frequency of stimulation that is greater than or equal to the reciprocal of the transmembrane time constant of said one or more cells.

18. (Previously presented) The method of Claim 1, wherein said two or more electrical fields are repeated at a frequency of stimulation within the range of zero to 1kHz.

19. (Previously Presented) The method of Claim 1, wherein said two or more electrical fields have a pulse duration within the range of about 100 microseconds to about 20 milliseconds.

20. (Original) The method of Claim 1, wherein said transmembrane potential is developed across the plasma membrane of said one or more cells.

21. (Currently Amended) A method of assaying the effect of a compound against a target voltage regulated ion channel, wherein said effect is manifested by transmembrane potential changes comprising:

selecting a cell line having a normal resting transmembrane potential corresponding to a selected voltage dependent state of said target voltage regulated ion channel;

expressing said target voltage regulated ion channel in a population of cells of said selected cell line;

exposing said population of cells to said compound;

repetitively exposing said population of cells to a series of two or more electric fields so as to effect a change in transmembrane potential of said population of cells, wherein said transmembrane potential changes predominantly in one direction away from a starting transmembrane potential over the course of said series of electric fields due to a continuing and additive accumulation of charge in said population of cells over the course of said series of electric fields; and

monitoring changes in the transmembrane potential of said population of cells to characterize the effect of said compound.

22. (Previously presented) The method of Claim 21, wherein said target voltage regulated ion channel is endogenously expressed in the cell line.

23. (Original) The method of Claim 21, wherein said cell line is transfected with nucleic acid encoding said target voltage regulated ion channel.

24. (Previously presented) The method of Claim 23, wherein said cell line expresses substantially only said target voltage regulated ion channel.

25. (Original) The method of Claim 24, wherein said cell line is selected from the group consisting of CHL, LTK(-), and CHO-K1.

26. (Previously presented) The method of Claim 21 wherein said target voltage regulated ion channel is a sodium channel, and wherein said population of cells is selected from the group consisting of CHL cells, LTK(-) cells, and CHO-K1 cells.

27. (Previously presented) The method of Claim 21 wherein said target voltage regulated ion channel is a sodium channel, and wherein said population of cells is selected from the group consisting of HEK-293 cells, RBL cells, F11 cells, and HL5 cells.

28. (Previously presented) The method of Claim 21 wherein said target voltage regulated ion channel is a potassium channel, and wherein said population of cells is selected from the group consisting of CHL cells, LTK(-) cells, and CHO-K1 cells.

29. (Previously presented) The method of Claim 21 wherein said target voltage regulated ion channel is a calcium channel, and wherein said population of cells is selected from the group consisting of CHL cells, LTK(-) cells, and CHO-K1 cells.

30-48 Cancelled

49. (Previously presented) The method of Claim 1, additionally comprising using said electric fields to maintain said transmembrane potential within a predefined range.

50. (Previously presented) The method of Claim 21, additionally comprising using said electric fields to maintain said transmembrane potential within a predefined range.